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(54) **HYBRID SYSTEM FOR COLLECTING AND UTILIZING PATIENT GENERATED INFORMATION**

(71) Applicant: **Mark D. Oswald**, San Diego, CA (US)

(72) Inventor: **Mark D. Oswald**, San Diego, CA (US)

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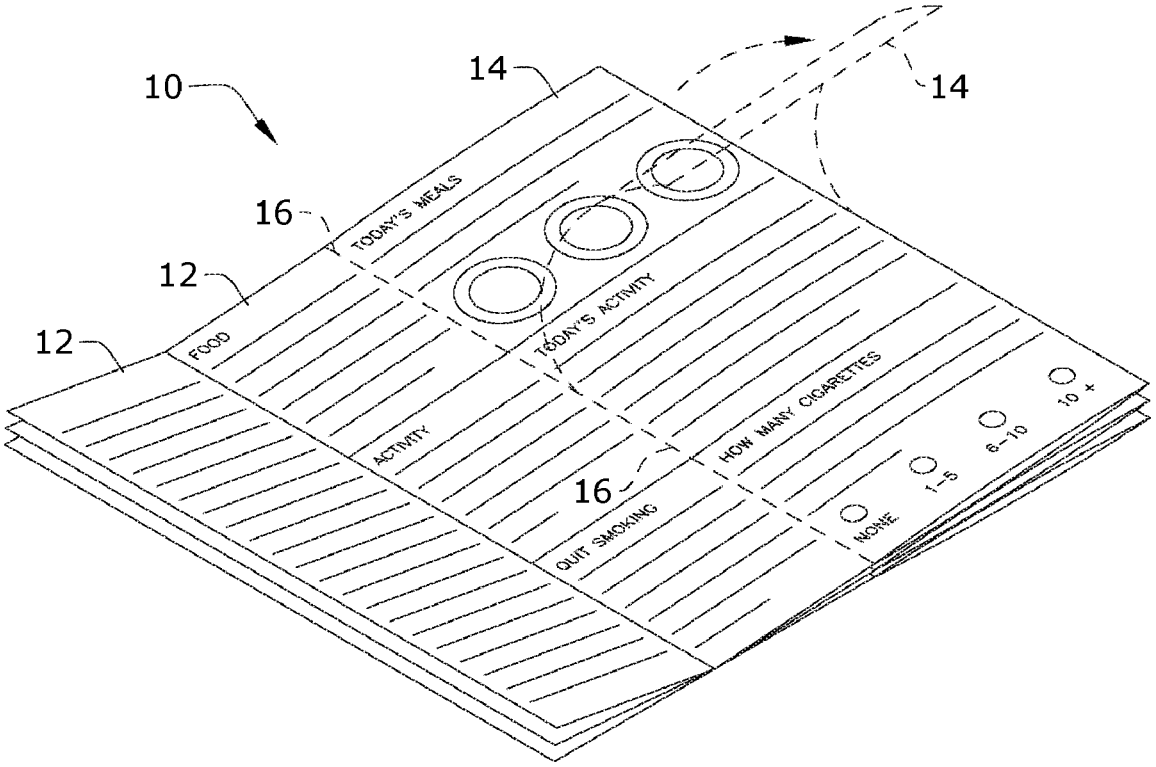
(57) **ABSTRACT**

A hybrid of traditional paper-based (analog) data collection forms and content, in combination with a set of digital software services is provided. This system embodies method and software components collect patient information such as health profile data, health measurements, and health assessments. This information is collected from the patient using a uniquely designed paper format and then translated into digital information. This digital information is then used to personalize a health management program with relevant content and iteratively presented back to the patient, again in paper form.



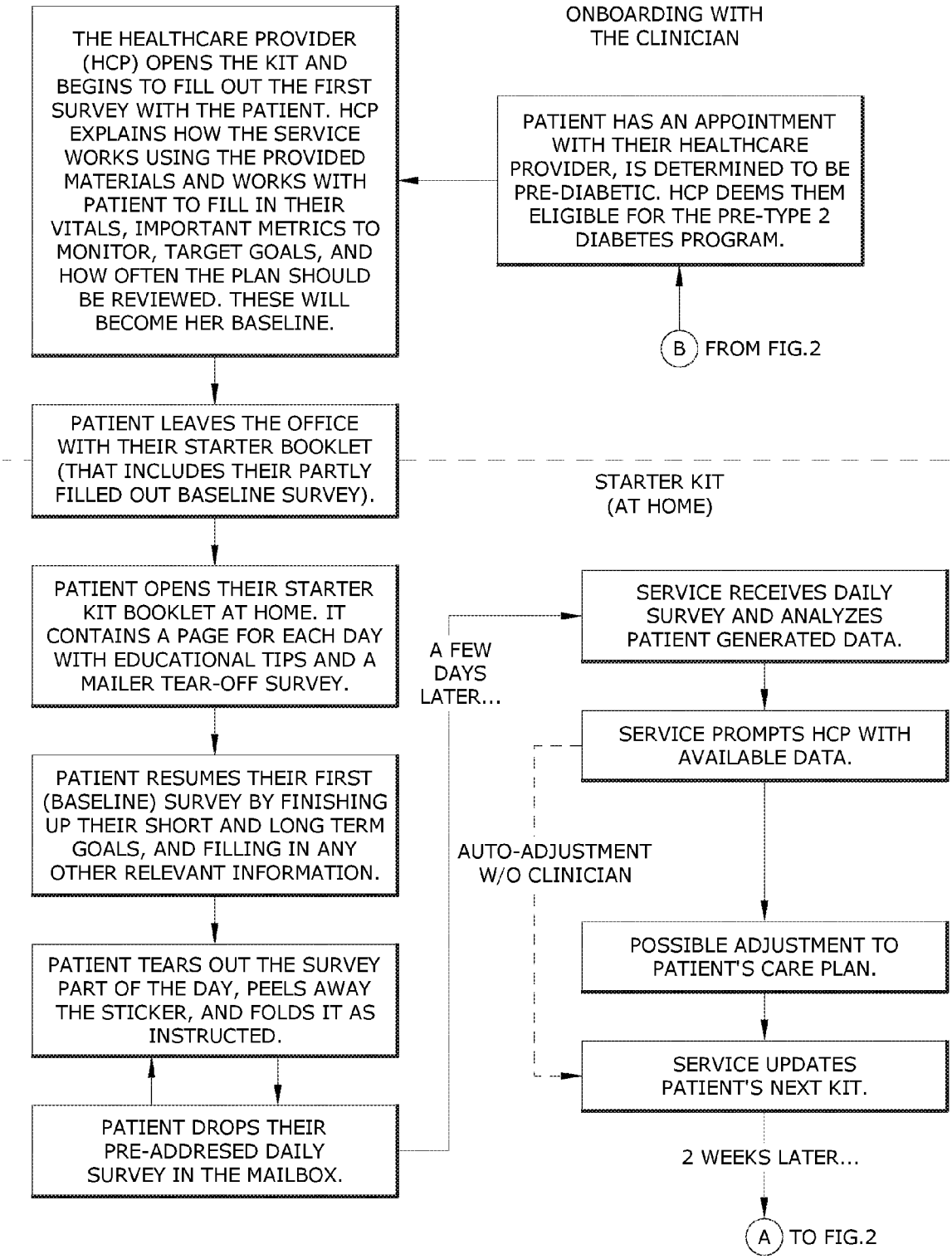

ONBOARDING WITH THE CLINICIAN
PATIENT HAS AN APPOINTMENT WITH THEIR HEALTHCARE PROVIDER, IS DETERMINED TO BE PRE-DIABETIC. HCP DEEMS THEM ELIGIBLE FOR THE PRE-TYPE 2 DIABETES PROGRAM.
B FROM FIG.2
THE HEALTHCARE PROVIDER (HCP) OPENS THE KIT AND BEGINS TO FILL OUT THE FIRST SURVEY WITH THE PATIENT. HCP EXPLAINS HOW THE SERVICE WORKS USING THE PROVIDED MATERIALS AND WORKS WITH PATIENT TO FILL IN THEIR VITALS, IMPORTANT METRICS TO MONITOR, TARGET GOALS, AND HOW OFTEN THE PLAN SHOULD BE REVIEWED. THESE WILL BECOME HER BASELINE.
PATIENT LEAVES THE OFFICE WITH THEIR STARTER BOOKLET (THAT INCLUDES THEIR PARTLY FILLED OUT BASELINE SURVEY).
STARTER KIT (AT HOME)
PATIENT OPENS THEIR STARTER KIT BOOKLET AT HOME. IT CONTAINS A PAGE FOR EACH DAY WITH EDUCATIONAL TIPS AND A MAILER TEAR-OFF SURVEY.
PATIENT RESUMES THEIR FIRST (BASELINE) SURVEY BY FINISHING UP THEIR SHORT AND LONG TERM GOALS, AND FILLING IN ANY OTHER RELEVANT INFORMATION.
PATIENT TEARS OUT THE SURVEY PART OF THE DAY, PEELS AWAY THE STICKER, AND FOLDS IT AS INSTRUCTED.
PATIENT DROPS THEIR PRE-ADDRESED DAILY SURVEY IN THE MAILBOX.
A FEW DAYS LATER...
SERVICE RECEIVES DAILY SURVEY AND ANALYZES PATIENT GENERATED DATA.
SERVICE PROMPTS HCP WITH AVAILABLE DATA.
AUTO-ADJUSTMENT W/O CLINICIAN
POSSIBLE ADJUSTMENT TO PATIENT'S CARE PLAN.
SERVICE UPDATES PATIENT'S NEXT KIT.
2 WEEKS LATER...
A TO FIG.2

FIG.1

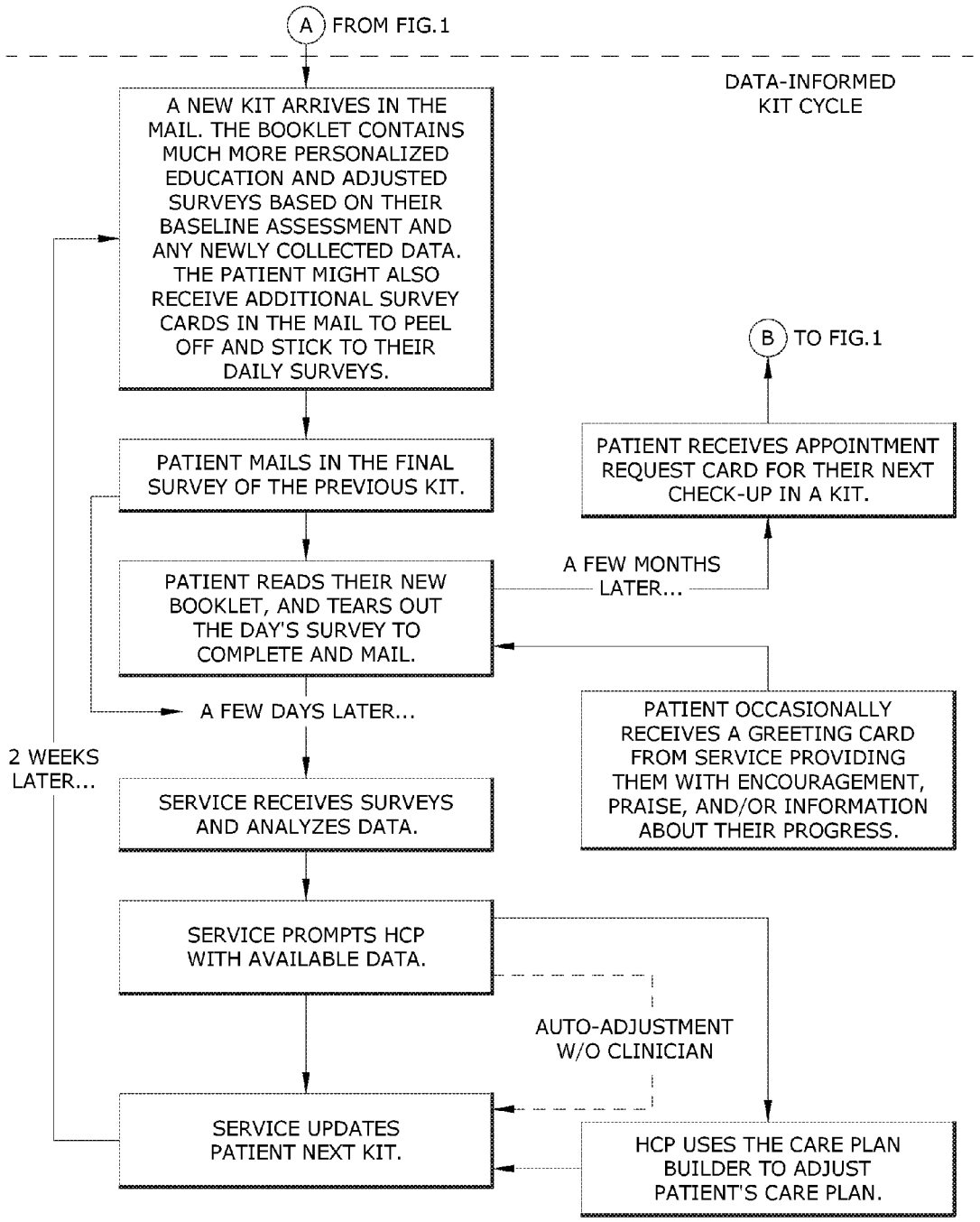

A
FROM FIG.1
DATA-INFORMED KIT CYCLE
A NEW KIT ARRIVES IN THE MAIL. THE BOOKLET CONTAINS MUCH MORE PERSONALIZED EDUCATION AND ADJUSTED SURVEYS BASED ON THEIR BASELINE ASSESSMENT AND ANY NEWLY COLLECTED DATA. THE PATIENT MIGHT ALSO RECEIVE ADDITIONAL SURVEY CARDS IN THE MAIL TO PEEL OFF AND STICK TO THEIR DAILY SURVEYS.
B
TO FIG.1
PATIENT RECEIVES APPOINTMENT REQUEST CARD FOR THEIR NEXT CHECK-UP IN A KIT.
PATIENT MAILS IN THE FINAL SURVEY OF THE PREVIOUS KIT.
A FEW MONTHS LATER...
PATIENT READS THEIR NEW BOOKLET, AND TEARS OUT THE DAY'S SURVEY TO COMPLETE AND MAIL.
A FEW DAYS LATER...
PATIENT OCCASIONALLY RECEIVES A GREETING CARD FROM SERVICE PROVIDING THEM WITH ENCOURAGEMENT, PRAISE, AND/OR INFORMATION ABOUT THEIR PROGRESS.
2 WEEKS LATER...
SERVICE RECEIVES SURVEYS AND ANALYZES DATA.
SERVICE PROMPTS HCP WITH AVAILABLE DATA.
AUTO-ADJUSTMENT W/O CLINICIAN
SERVICE UPDATES PATIENT NEXT KIT.
HCP USES THE CARE PLAN BUILDER TO ADJUST PATIENT'S CARE PLAN.

FIG.2

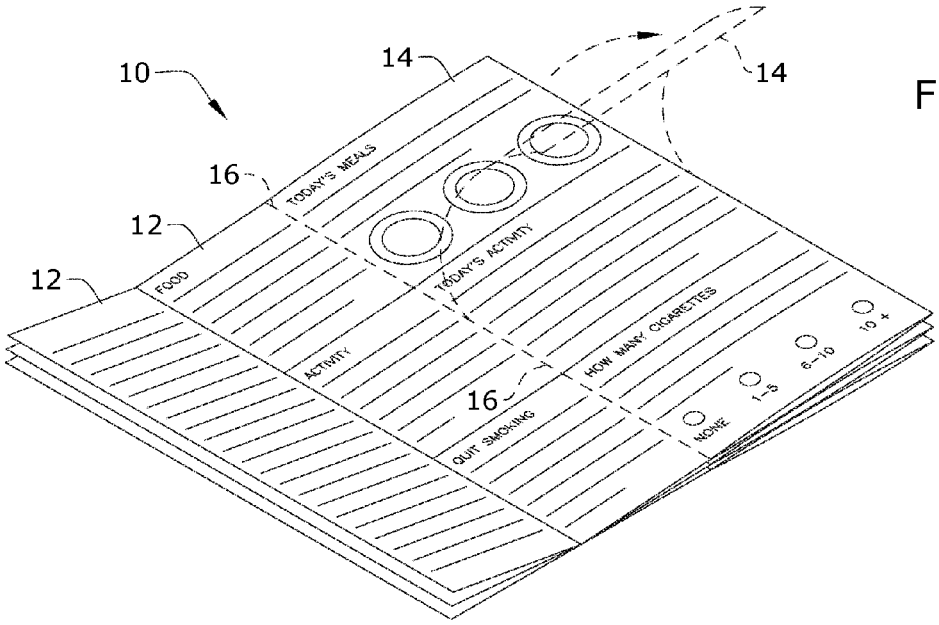


FIG.3

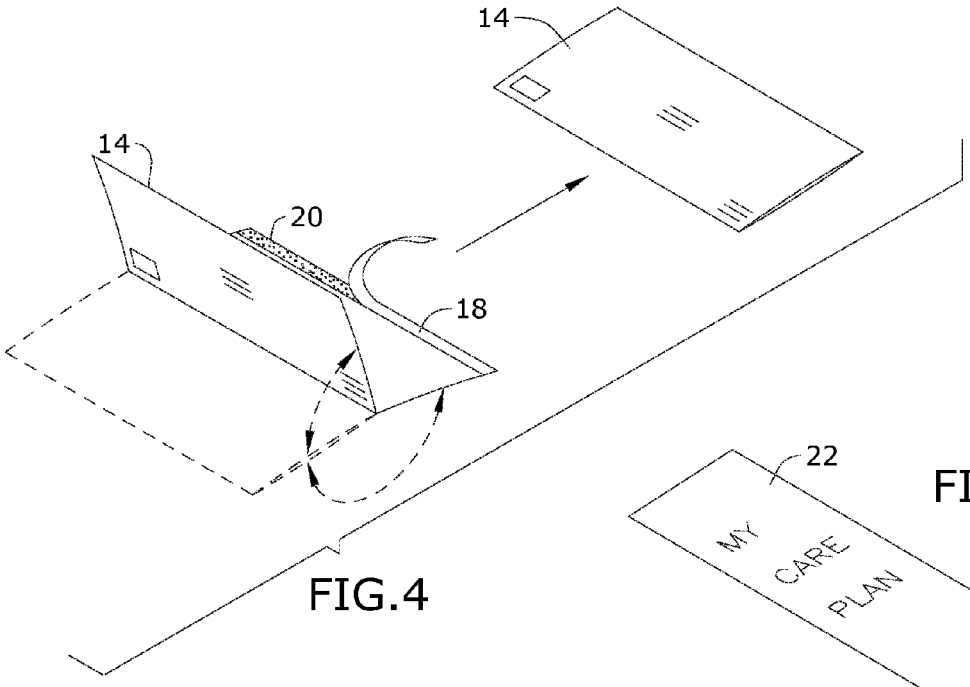


FIG.4

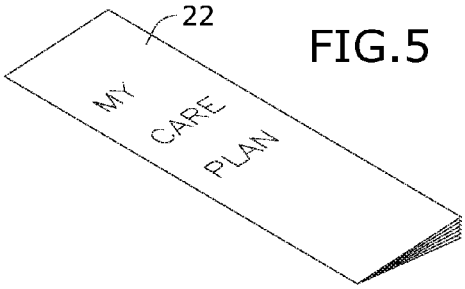


FIG.5

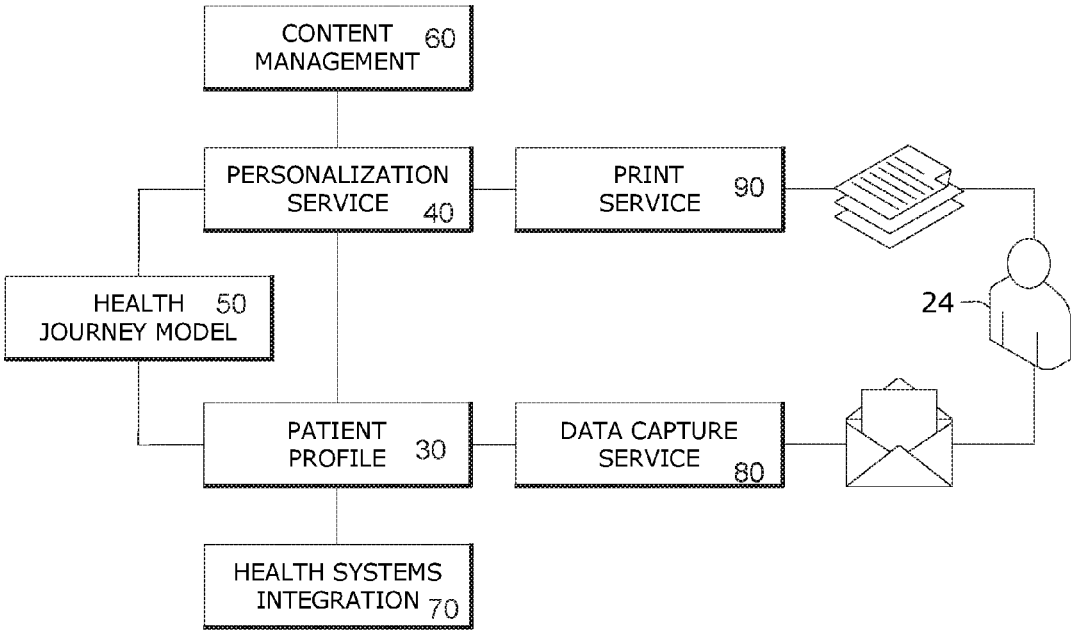

CONTENT MANAGEMENT 60
PERSONALIZATION SERVICE 40
PRINT SERVICE 90
HEALTH JOURNEY MODEL 50
24
PATIENT PROFILE 30
DATA CAPTURE SERVICE 80
HEALTH SYSTEMS INTEGRATION 70

FIG.6

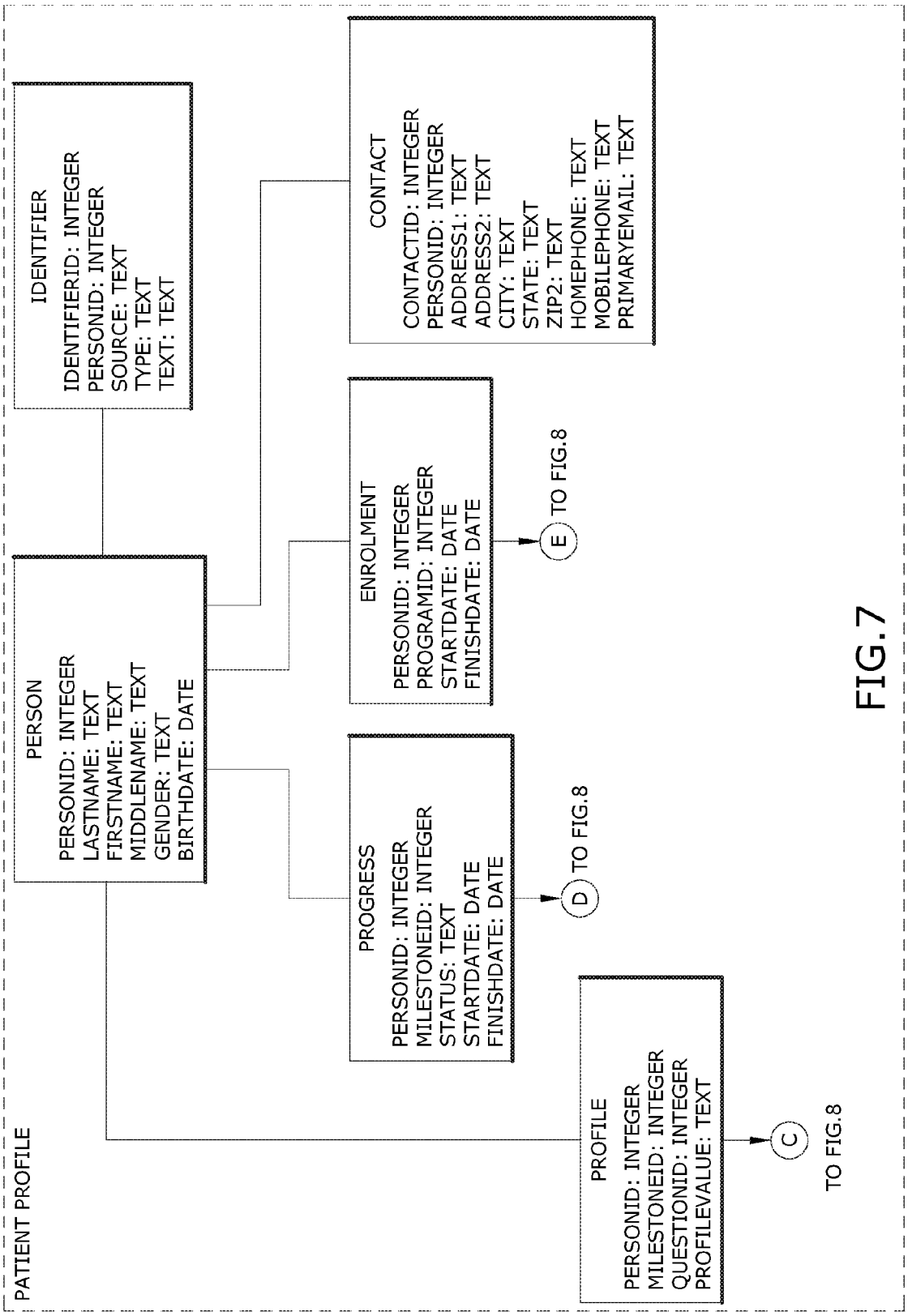

PATIENT PROFILE
PERSON
PERSONID: INTEGER
LASTNAME: TEXT
FIRSTNAME: TEXT
MIDDLENAME: TEXT
GENDER: TEXT
BIRTHDATE: DATE
IDENTIFIER
IDENTIFIERID: INTEGER
PERSONID: INTEGER
SOURCE: TEXT
TYPE: TEXT
TEXT: TEXT
CONTACT
CONTACTID: INTEGER
PERSONID: INTEGER
ADDRESS1: TEXT
ADDRESS2: TEXT
CITY: TEXT
STATE: TEXT
ZIP2: TEXT
HOMEPHONE: TEXT
MOBILEPHONE: TEXT
PRIMARYEMAIL: TEXT
ENROLMENT
PERSONID: INTEGER
PROGRAMID: INTEGER
STARTDATE: DATE
FINISHDATE: DATE
E
TO FIG.8
PROGRESS
PERSONID: INTEGER
MILESTONEID: INTEGER
STATUS: TEXT
STARTDATE: DATE
FINISHDATE: DATE
D
TO FIG.8
PROFILE
PERSONID: INTEGER
MILESTONEID: INTEGER
QUESTIONID: INTEGER
PROFILEVALUE: TEXT
C
TO FIG.8

FIG.7

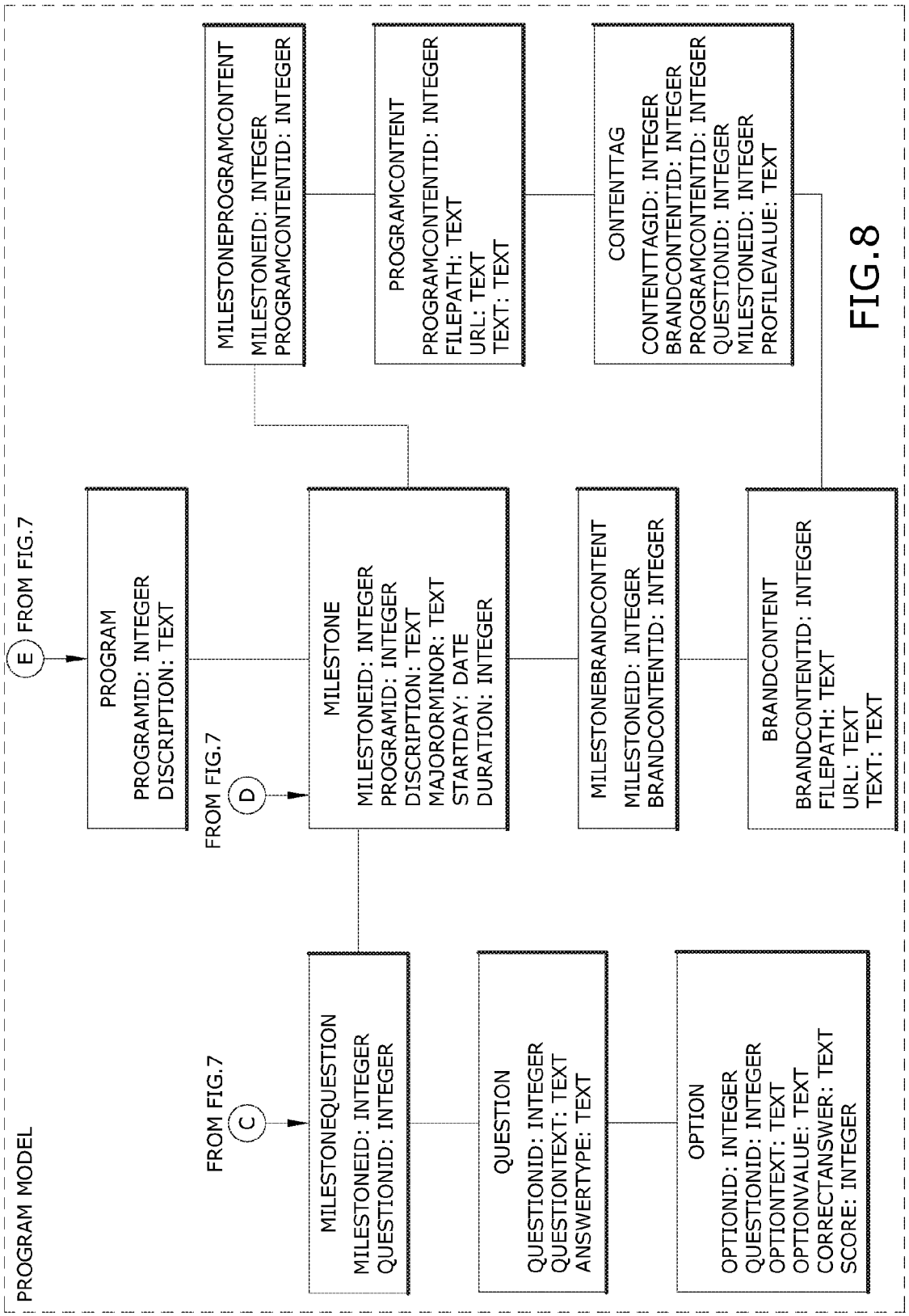

PROGRAM MODEL
E FROM FIG.7
PROGRAM
PROGRAMID: INTEGER
DISCRIPTION: TEXT
FROM FIG.7
D
MILESTONE
MILESTONEID: INTEGER
PROGRAMID: INTEGER
DISCRIPTION: TEXT
MAJORORMINOR: TEXT
STARTDAY: DATE
DURATION: INTEGER
MILESTONEPROGRAMCONTENT
MILESTONEID: INTEGER
PROGRAMCONTENTID: INTEGER
PROGRAMCONTENT
PROGRAMCONTENTID: INTEGER
FILEPATH: TEXT
URL: TEXT
TEXT: TEXT
CONTENTTAG
CONTENTTAGID: INTEGER
BRANDCONTENTID: INTEGER
PROGRAMCONTENTID: INTEGER
QUESTIONID: INTEGER
MILESTONEID: INTEGER
PROFILEVALUE: TEXT
MILESTONEBRANDCONTENT
MILESTONEID: INTEGER
BRANDCONTENTID: INTEGER
BRANDCONTENT
BRANDCONTENTID: INTEGER
FILEPATH: TEXT
URL: TEXT
TEXT: TEXT
FROM FIG.7
C
MILESTONEQUESTION
MILESTONEID: INTEGER
QUESTIONID: INTEGER
QUESTION
QUESTIONID: INTEGER
QUESTIONTEXT: TEXT
ANSWERTYPE: TEXT
OPTION
OPTIONID: INTEGER
QUESTIONID: INTEGER
OPTIONTEXT: TEXT
OPTIONVALUE: TEXT
CORRECTANSWER: TEXT
SCORE: INTEGER

FIG.8

HYBRID SYSTEM FOR COLLECTING AND UTILIZING PATIENT GENERATED INFORMATION

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of priority of U.S. provisional application No. 62/392,727, filed 8 Jun. 2016, the contents of which are herein incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a system for collecting patient-generated health data as part of a personalized health management program and, more particularly, to a hybrid of traditional paper-based (analog) data collection forms and content, in combination with a set of digital software services.

[0003] Current approaches to collecting patient-generated health data live exclusively in the digital domain or the analog/paper world. Over the years, the majority of patient health programs have existed with only paper-based content and forms. More recently, numerous web sites and mobile applications for presenting health content and collecting health information digitally have developed.

[0004] As a result, today's patient engagement programs aren't scalable or effective. Mobile and digital health solutions are too complex, too costly, and provide the wrong user experience for most of the target population, i.e., the patients that need them the most. On the other hand, 100-percent paper-based solutions don't provide a feedback loop and don't allow for collection of personal health data or personalized content delivery.

[0005] As can be seen, there is a need for a hybrid of traditional paper-based (analog) data collection forms and content, in combination with a set of digital software services, providing the right user experience (physical/paper) with all the benefits of a digital information system through combining a digital back-end with a front-end delivery channel based on physical media. The program of the present invention supports patient-generated data collection (assessments, health measurements, etc.) and personalized content delivery with structured health programs and branded content by incorporating a data collection mechanism which results in digital information. This digital information, in turn, is used within a feedback loop which uses the same physical/paper communication channel to deliver personalized and programmed health content.

SUMMARY OF THE INVENTION

[0006] In one aspect of the present invention, method and software components collect patient information such as health profile data, health measurements, and health assessments. This information is collected from the patient using a uniquely designed paper format and then translated into digital information. This digital information is then used to personalize a health management program with relevant content and iteratively presented back to the patient, again in paper form.

[0007] In another aspect of the present invention, a method of providing a personalize a health management program includes providing an initial booklet in a paper format to establish a baseline health profile for a predetermined health management program, wherein the paper format provides a separable survey having a plurality of questions related to health information pertinent to the predetermined health management program; prompting a user to hand-write answer to the plurality of questions, wherein the hand-written answers comprise health data; prompting the user to mail said initial survey to a predetermined address; providing a computing system to receive and translate the hand-written answers into a digital patient profile comprising the health data, wherein the computing system is configured to associate the predetermined health management program with the digital patient profile for generating at least one personalized booklet based in part thereon; and providing the at least one personalized booklet in said paper format to the user.

[0008] In yet another aspect of the present invention, a hybrid of traditional paper-based (analog) data collection forms and content, in combination with a set of digital software services embodies the above-mentioned method and further includes at least one personalized booklet having personalized health content based in part on the digital patient profile, wherein each separable survey includes a tear-off mailer mechanism, wherein the tear-off mailer mechanism further comprises a tear line connecting the respective booklet and separable survey, wherein each separable survey further comprises at least one fold line, peel-away paper and adhesive for mailing in the separable survey, wherein the personalized health content includes goals associated with the predetermined health management program, and wherein the computing system further includes a data capture service for translating the hand-written answers into the digital patient profile; a personalization service coupled to the data capture for composing the personalized health content based on the digital patient profile; and a print service coupled to the personalization service for generating at least one personalized booklet.

[0009] These and other features, aspects and advantages of the present invention will become better understood with reference to the following drawings, description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** is a process flowchart of an exemplary embodiment of the present invention;

[0011] FIG. **2** is a continuation of FIG. **1**;

[0012] FIG. **3** is a perspective view of an exemplary embodiment of a booklet of the present invention used in collecting and presenting patient health information;

[0013] FIG. **4** is a perspective view of an exemplary embodiment of a mail-in survey illustrating a fold;

[0014] FIG. **5** is a perspective view of an exemplary embodiment of an educational or profile booklet;

[0015] FIG. **6** is a flowchart of an exemplary embodiment of the present invention;

[0016] FIG. **7** is a data diagram of an exemplary embodiment of a patient's profile of the present invention; and

[0017] FIG. **8** is a data diagram of an exemplary embodiment of a program model the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The following detailed description is of the best currently contemplated modes of carrying out exemplary embodiments of the invention. The description is not to be

taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention, since the scope of the invention is best defined by the appended claims.

[0019] Broadly, an embodiment of the present invention provides a hybrid of traditional paper-based (analog) data collection forms and content, in combination with a set of digital software services. This system embodies method and software components collect patient information such as health profile data, health measurements, and health assessments. This information is collected from the patient using a uniquely designed paper format and then translated into digital information. This digital information is then used to personalize a health management program with relevant content and iteratively presented back to the patient, again in paper form.

[0020] The present invention may include at least one computer with a user interface. The computer may include at least one processing unit and a form of memory including, but not limited to, a desktop, laptop, and smart device, such as, a tablet and smart phone. The computer includes a program product including a machine-readable program code for causing, when executed, the computer to perform steps. The program product may include software which may either be loaded onto the computer or accessed by the computer. The loaded software may include an application on a smart device. The software may be accessed by the computer using a web browser. The computer may access the software via the web browser using the internet, extranet, intranet, host server, internet cloud and the like.

[0021] Referring to FIGS. **1** through **8**, the present invention may embody a method of providing a personalized health management program. The user **24** experience may begin with receiving the initial content kit/booklet **10**, which is not personalized for each individual patient-user **24**, but general in nature relating to a health topic such as pre-diabetes or heart health. The user **24** may register for the program by completing the initial survey to establish their baseline health profile and account. The initial survey may be initiated or finalized during an initial appointment for a healthcare provider or can be initiated and/or finalized in a take home paper format, such as the content kit/booklet **10**, wherein a mail-in survey **14** with tear lines **16** may be torn from the content kit/booklet **10** and mailed in via a unique booklet and mailer design having peel-away paper **18** and adhesive **20**, as illustrated in FIG. **4**. Receipt of this initial survey establishes the user **24**-patient in the system embodying the method of the present invention. The system may associate a unique identity/identifier that is encoded into the booklet(s). On subsequent days, the user **24** reads the relevant health content **12** and completes additional surveys, collecting various health measurements, activities, assessments, etc. These surveys may also be torn from the booklet and mailed in a similar fashion as mentioned above.

[0022] Once the initial phase of the program is complete, and all surveys have been completed, the user **24** will receive an additional booklet **22**, which has both program content and additional data collection surveys. Unlike the first kit, the content of this program booklet **22** is highly personalized based on the digital patient profile that is being created behind the scenes.

[0023] The program booklets **22** are a unique design that combines relevant health content with data collection forms. Pages of the booklet that have data collection forms also have a tear-off section, which can be folded and mailed. The hand-written form data is converted into digital information using automated recognition and translation techniques. There is also a patient identity encoded on each mailer so that all data can be associated with the correct patient profile.

[0024] In an additional embodiment, the program content and survey forms may be incorporated into a traditional notebook system, such as a three-ring (or other) binder. This alternative form factor would still be used to organize the relevant program content, including both static content as well as more dynamic and personalized content and information.

[0025] In another embodiment, the program content and survey forms may be part of a delivery mechanism which combines stored video content on a low-cost embedded LCD screen (as one example) along with printed content and survey forms.

[0026] Referring the FIG. **6**, there may be a plurality of major system components of the present invention: including a patient profile **30**; a personalization engine **40**; a health journey model **50**; a content management service **60**; a health systems integration **70**; a data capture service **80**; and a print service **90**.

[0027] The patient profile **30** may be a set of data structures that represent what has been captured and analyzed regarding each user **24**. It may include elements related to patient preferences (for system engagement and communication), initial and ongoing health status, health measurement data such as glucose levels and blood pressure readings, activity level, ongoing self-assessment data, and progress reporting.

[0028] The health journey model **50** may include structured data model outlines a typical pathway for a user **24** through a particular health condition such as diabetes or cardiac rehabilitation. A health journey may be composed of various phases (or stages) such as awareness, presence of symptoms, pre-diagnosis, diagnosis, treatment, follow-up care, and maintenance. A health journey may also indicate recommended "touch points" with the healthcare system or with healthcare providers. Also, other moments/events of interest may be identified as part of the health journey. A health journey may also identify the typical emotional characteristics and concerns that a patient might have during a particular phase of their journey.

[0029] The content model and content management components **60** may be an important element containing the relevant informational and education material that is presented to the user **24**. The content model is organized in such a way that various discrete content elements can be used as part of the personalization service **40**, such that the most appropriate content can be selected and presented based on an algorithm that references the patient profile **30** and health journey model **50** (see personalization service below).

[0030] The personalization service **40** references the patient profile **30**, the health journey model, and the content model. It is used to compose the content of the program booklet, based on how the user **24** is progressing through their health journey, with additional criteria that is derived from the user **24** profile. The personalization service provides input into the print service to generate the user **24** personalized booklet/kit **10**.

[0031] The data capture service **80** is one of the key elements of this hybrid patient-generated data system. A user **24** will complete one or more of the survey forms **14**, tear

off the form from the booklet **10**, fold it, and mail it using the pre-addressed and postage-paid mailing envelope. The computing system may use automated image and character recognition to translate the hand-written paper forms into digital information (analog-to-digital conversion). As the booklets **10** and forms **14** contain encoded identity information, this identity will be used to associate the new data with an existing user **24** profile.

[0032] The print service **90** may be driven by the personalization service **40** and generates new and personalized program booklets for each user **24**. The booklets may contain relevant content and data collection forms, based on the user **24** status within their health journey, as well as personal information from their profile. The print service **90** may provide document templates and the transmitting of the booklets to the user **24** on a regular basis, dependent on the program design.

[0033] The computer-based data processing system and method described above is for purposes of example only, and may be implemented in any type of computer system or programming or processing environment, or in a computer program, alone or in conjunction with hardware. The present invention may also be implemented in software stored on a computer-readable medium and executed as a computer program on a general purpose or special purpose computer. For clarity, only those aspects of the system germane to the invention are described, and product details well known in the art are omitted. For the same reason, the computer hardware is not described in further detail. It should thus be understood that the invention is not limited to any specific computer language, program, or computer. It is further contemplated that the present invention may be run on a stand-alone computer system, or may be run from a server computer system that can be accessed by a plurality of client computer systems interconnected over an intranet network, or that is accessible to clients over the Internet. In addition, many embodiments of the present invention have application to a wide range of industries. To the extent the present application discloses a system, the method implemented by that system, as well as software stored on a computer-readable medium and executed as a computer program to perform the method on a general purpose or special purpose computer, are within the scope of the present invention. Further, to the extent the present application discloses a method, a system of apparatuses configured to implement the method are within the scope of the present invention.

[0034] It should be understood, of course, that the foregoing relates to exemplary embodiments of the invention and that modifications may be made without departing from the spirit and scope of the invention as set forth in the following claims.

What is claimed is:

1. A method of providing a personalize a health management program, comprising:

providing an initial booklet in a paper format to establish a baseline health profile for a predetermined health management program, wherein the paper format provides a separable survey having a plurality of questions related to health information pertinent to the predetermined health management program;

prompting a user to hand-write answer to the plurality of questions, wherein the hand-written answers comprise health data;

prompting the user to mail said initial survey to a predetermined address;

providing a computing system to receive and translate the hand-written answers into a digital patient profile comprising the health data, wherein the computing system is configured to associate the predetermined health management program with the digital patient profile for generating at least one personalized booklet based in part thereon; and

providing the at least one personalized booklet in said paper format to the user.

2. The method of claim **1**, wherein the at least one personalized booklet further comprises personalized health content based in part on the digital patient profile.

3. The method of claim **1**, wherein each separable survey includes a tear-off mailer mechanism.

4. The method of claim **3**, wherein the tear-off mailer mechanism further comprises a tear line connecting the respective booklet and separable survey.

5. The method of claim **3**, wherein each separable survey further comprises at least one fold line, peel-away paper and adhesive for mailing in the separable survey.

6. The method of claim **2**, wherein the personalized health content includes goals associated with the predetermined health management program.

7. The method of claim **2**, wherein the computing system further comprises:

a data capture service for translating the hand-written answers into the digital patient profile;

a personalization service coupled to the data capture for composing the personalized health content based on the digital patient profile; and

a print service coupled to the personalization service for generating at least one personalized booklet.

* * * * *